

# CALIPSO, CloudSat, CERES, and MODIS Merged Data Product: Status

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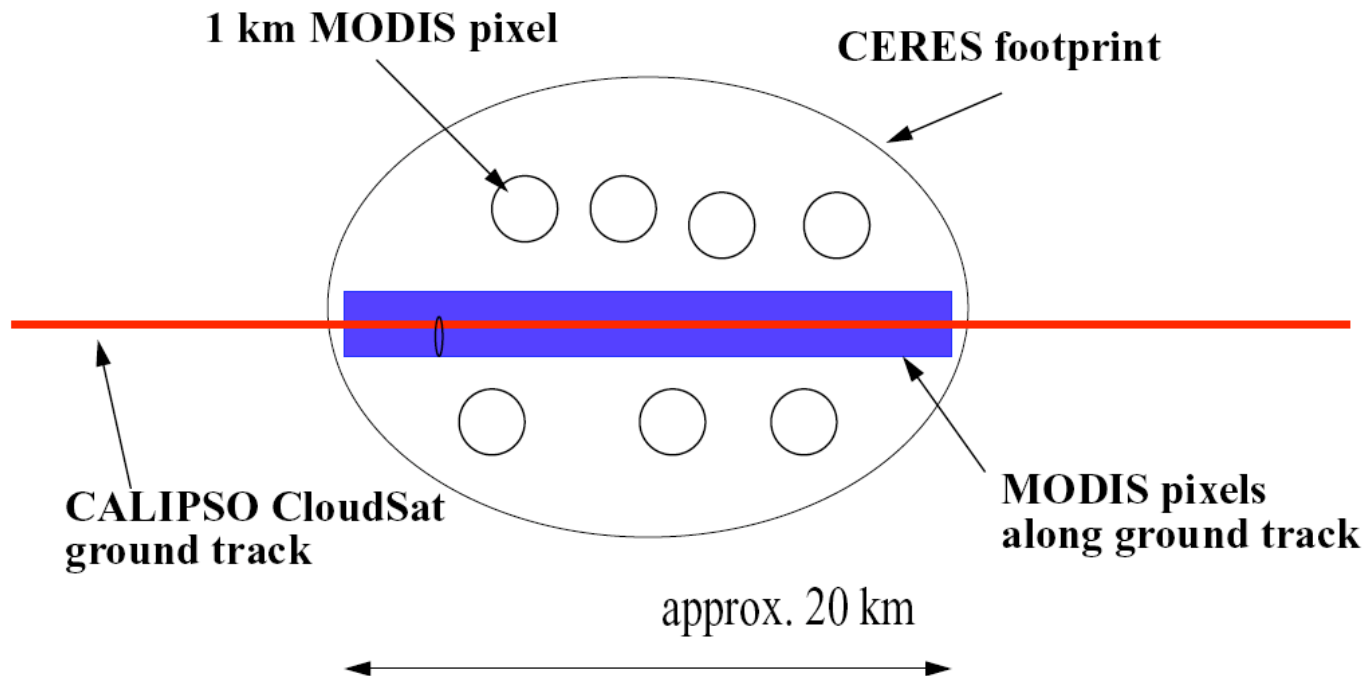
Science and Systems and  
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# CALIPSO, CloudSat, CERES, and MODIS (C3M)

- Funded by the NASA Energy Water Cycle Study (NEWS) project.
- Cloud and aerosol vertical profiles derived from CALIPSO and CloudSat are collocated
- CALIPSO and CloudSat cloud profiles are grouped and saved up to 15 different profiles.
- All MODIS-derived cloud and aerosol properties that are included in SSF over ground track of CALIPSO and CloudSat and the entire CERES footprint are included
- MODIS-derived spectral surface albedo
- Radiative flux profile

# CALIPSO CloudSat MODIS merging with CERES



## Clouds over a CERES footprint

- CALIPSO and CloudSat cloud profiles are grouped and saved up to 15 different profiles.

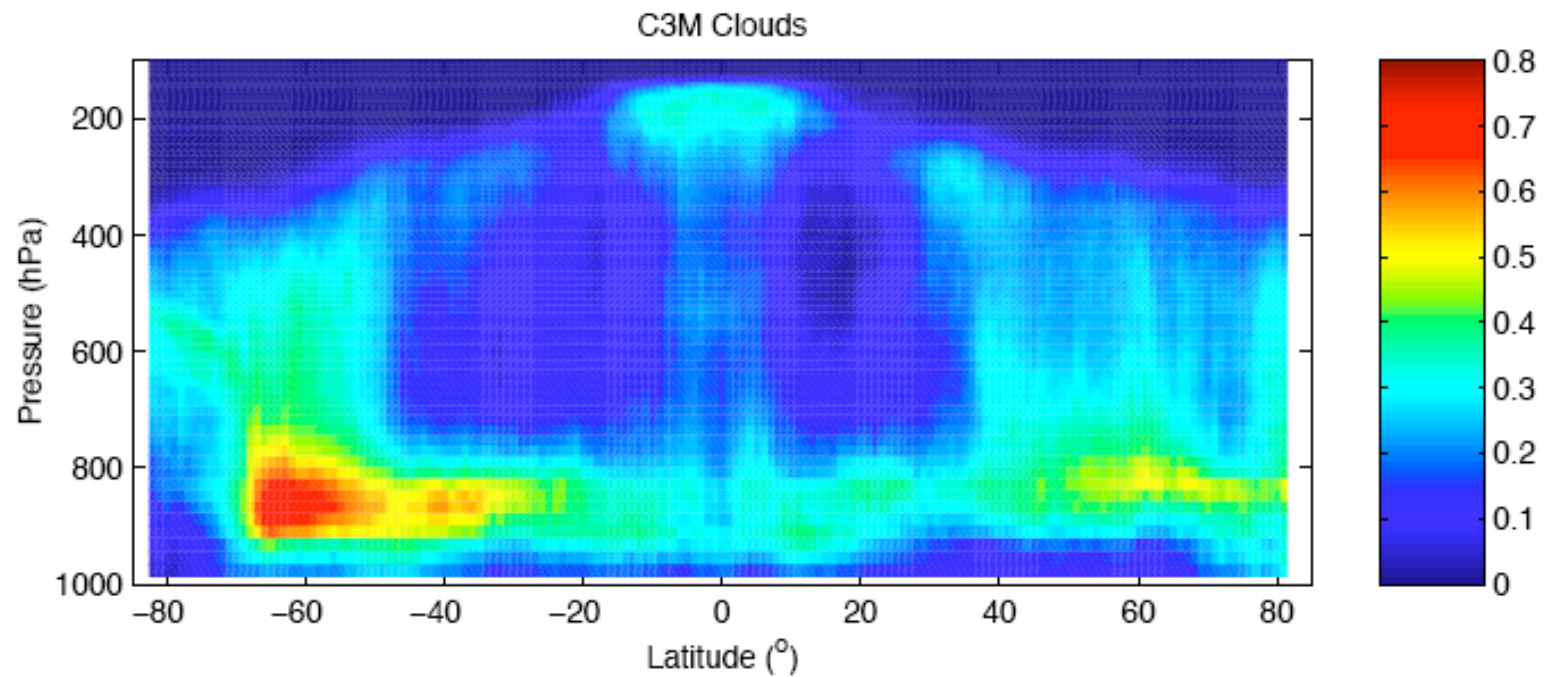
# Work has been done so far

- Merged 1 month(April 2007) of CALIPSO (VFM), CloudSat (CLOUDCLAS), and MODIS.
- Developed best cloud mask strategy
- Developed surface albedo algorithm
- Made the draft of C3M data catalog

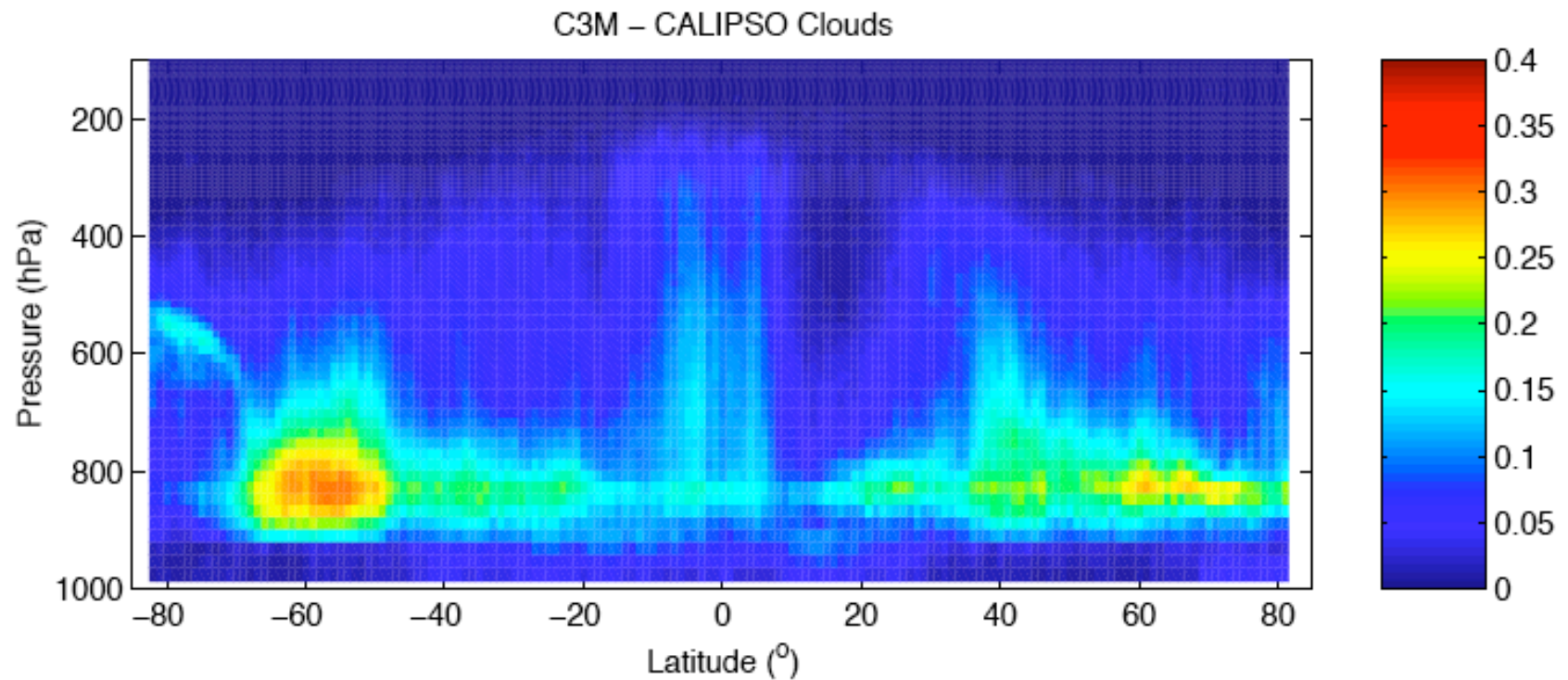
# Cloud masking strategy

Cloud Boundary	CALIPSO	CloudSat	Merged Cloud Boundary
Top	Detected	Detected	Higher Cloud Top
Top	Detected	Undetected	CALIPSO Cloud Top
Top	Undetected	Detected	CloudSat Cloud Top
Base	Not Attenuated	Undetected	CALIPSO Cloud Base
Base	Not Attenuated	Detected	CALIPSO Cloud Base
Base	Attenuated	Detected	CloudSat Cloud Base
Base	Attenuated	Undetected	CALIPSO lowest unattenuated level

# Merged clouds

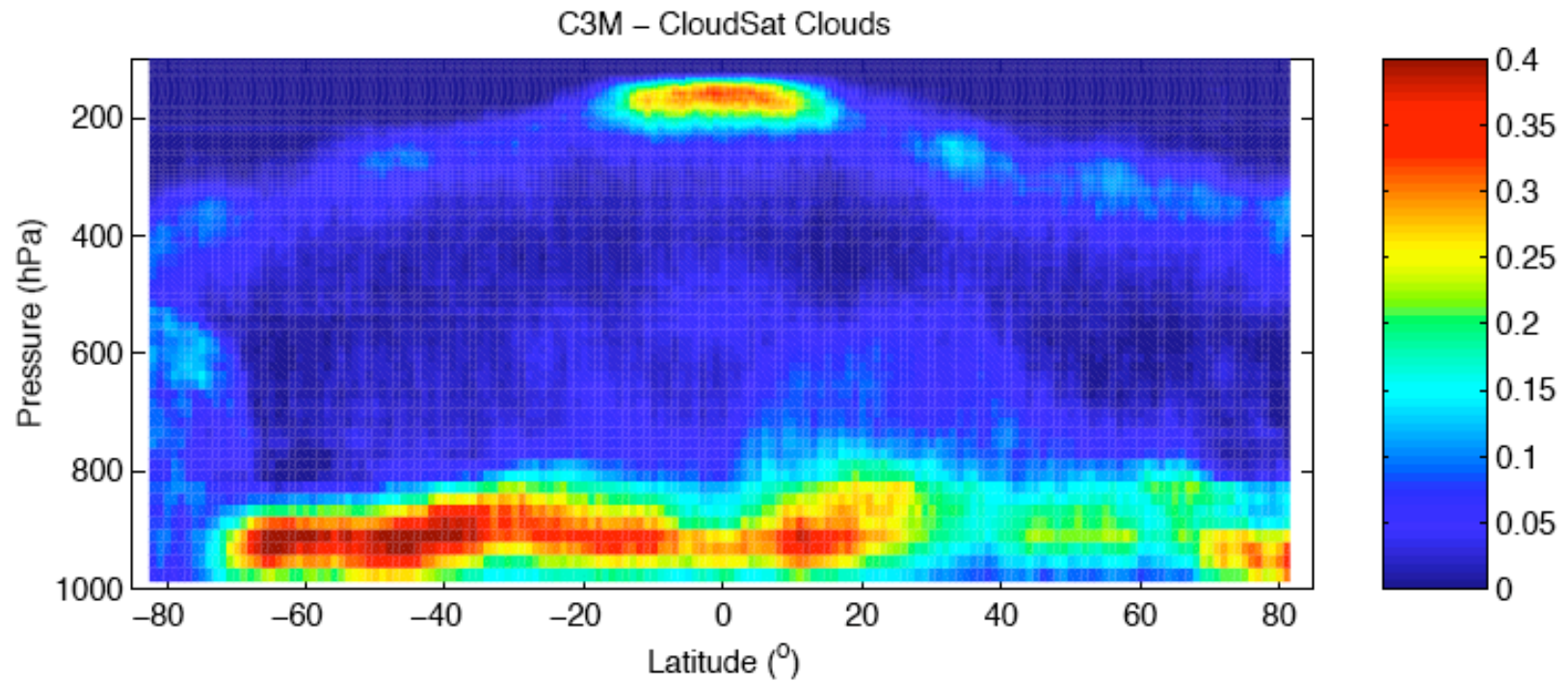


# Missed by CALIPSO

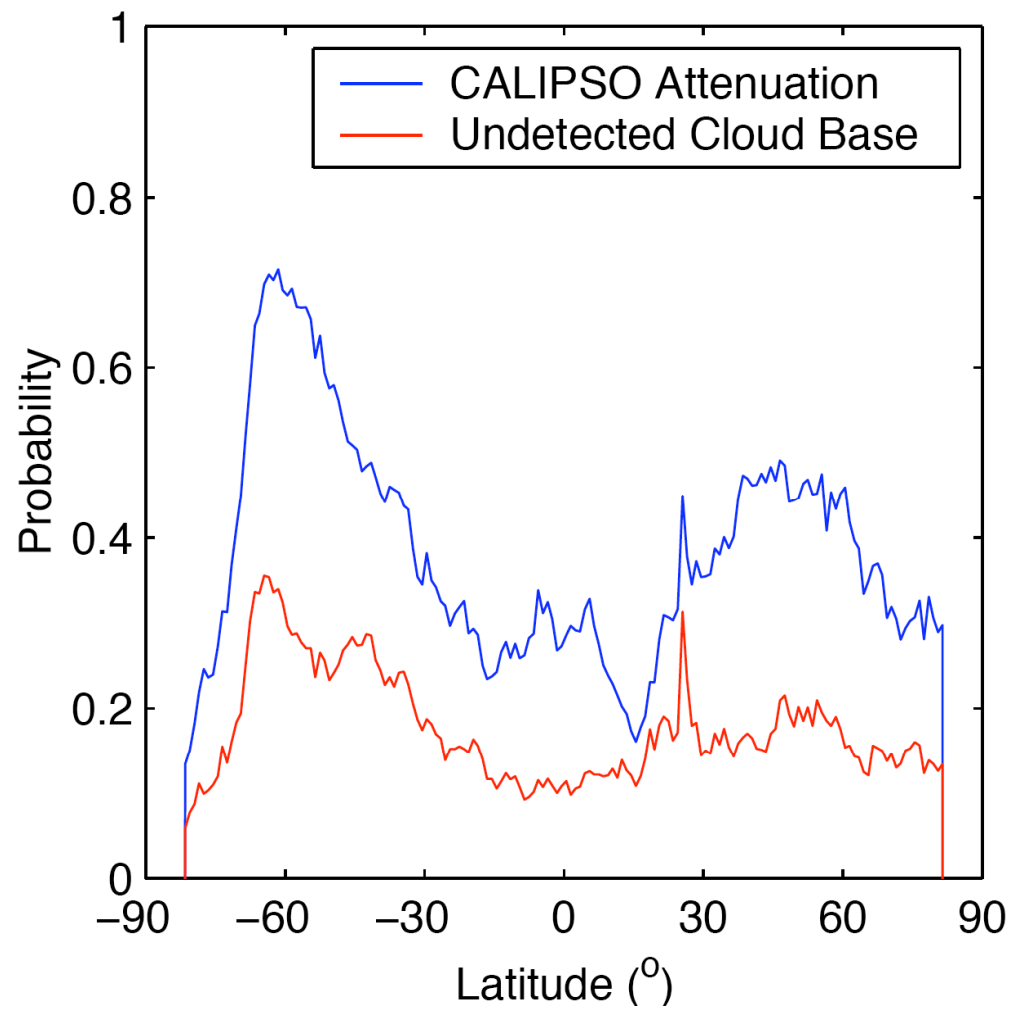




# Missed by CloudSat

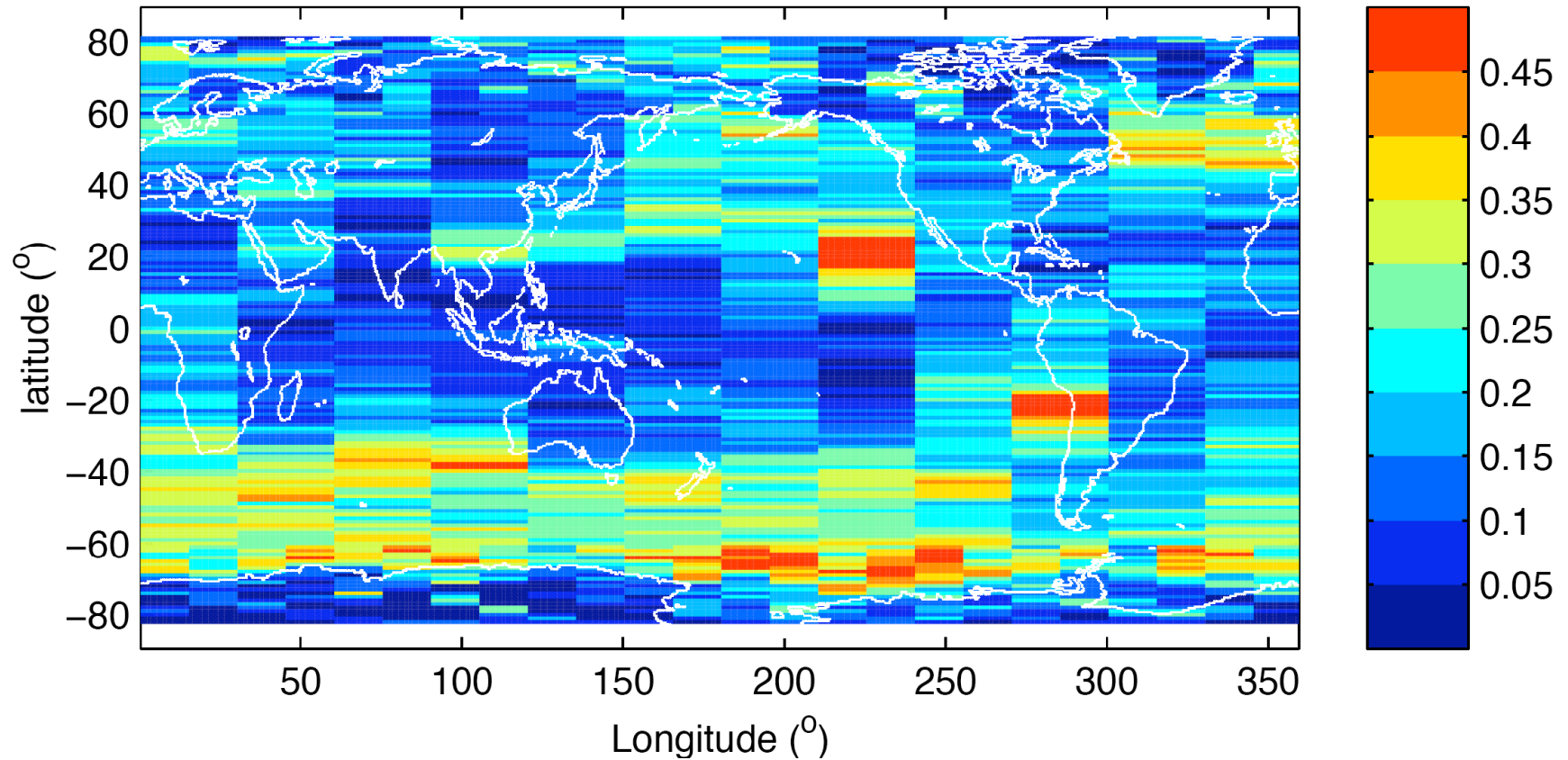


# Zonal



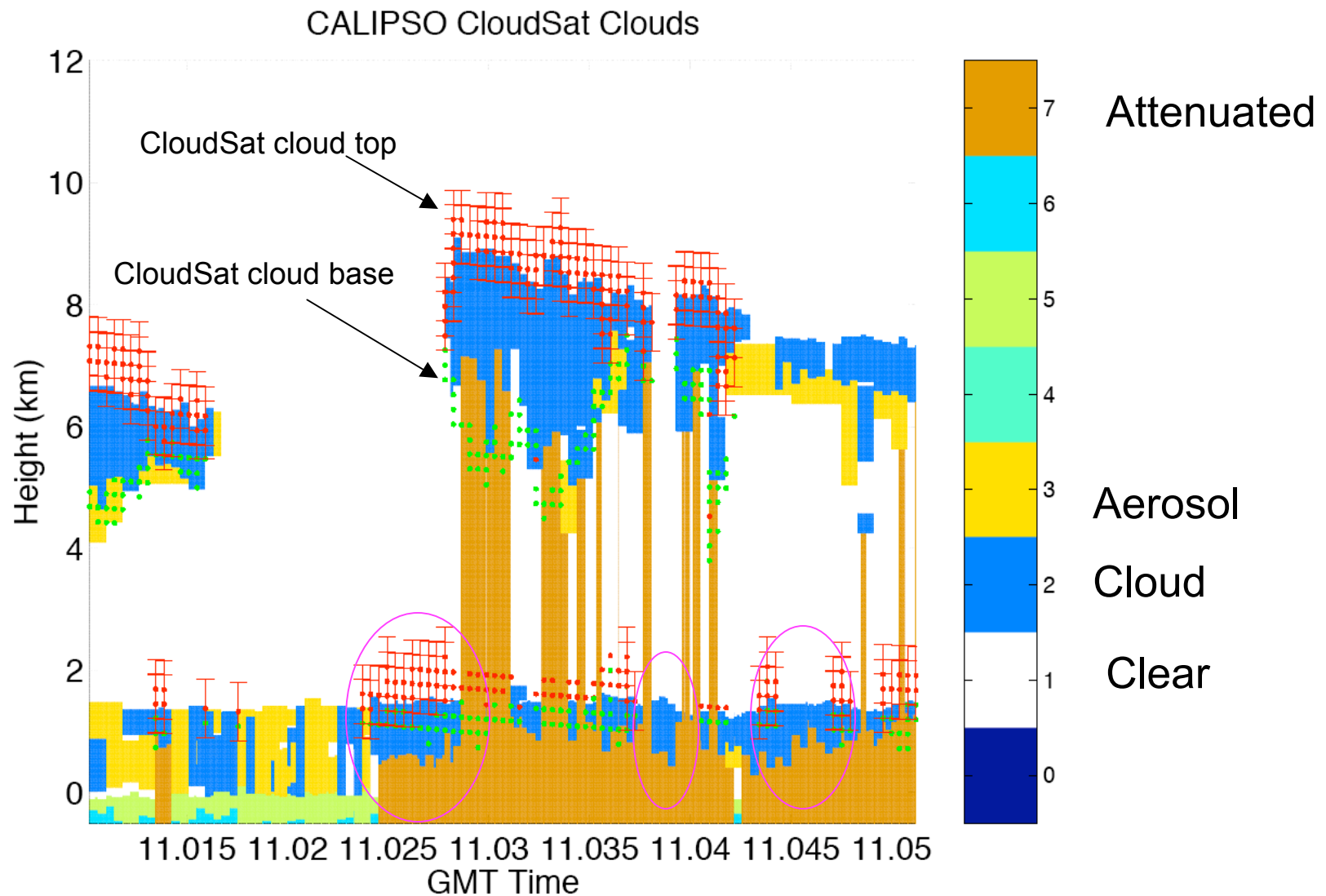
# Missed Cloud Base

Missed Cloud Base (Missed / CALIPSO clouds)

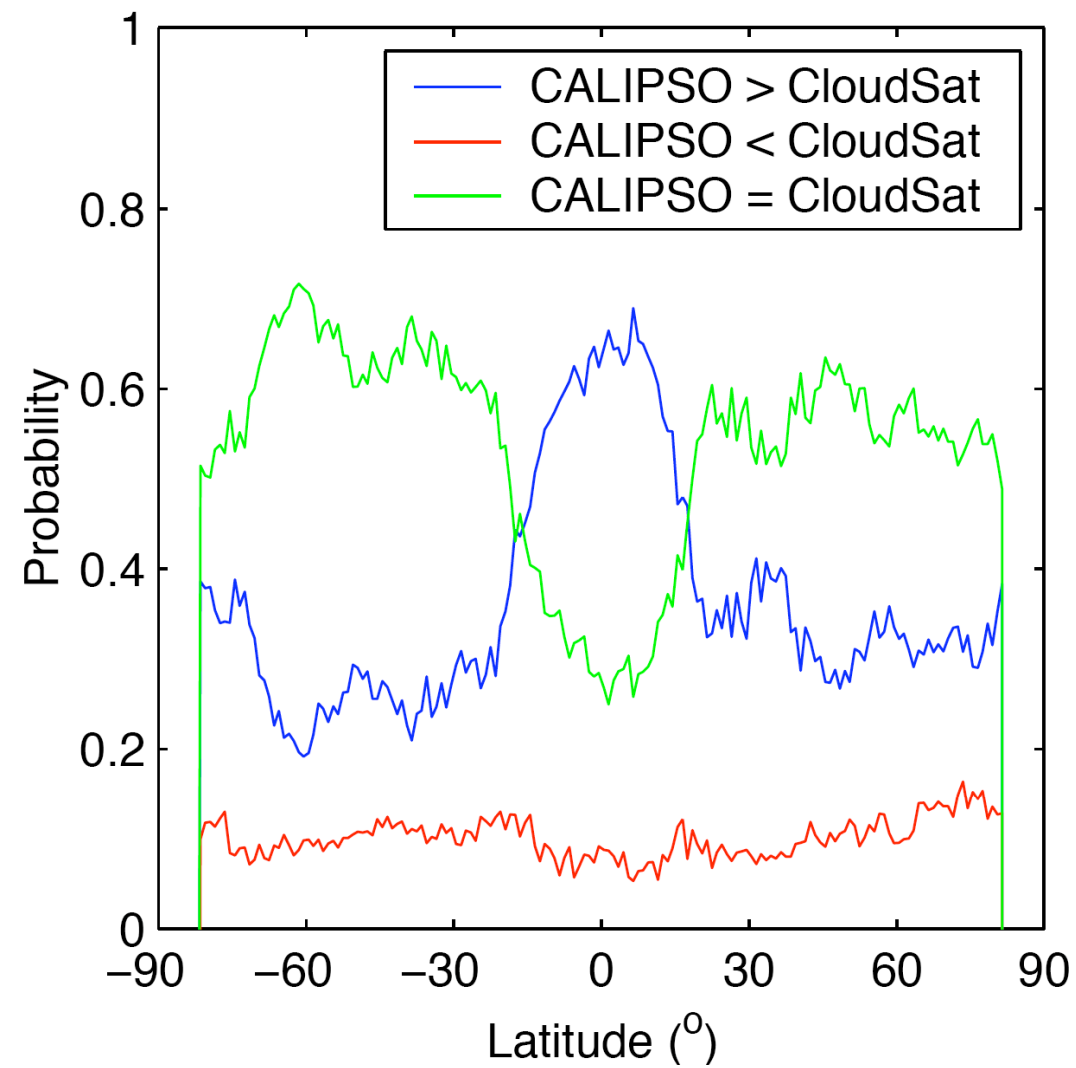


Probability of CloudSat cloud base higher than  
CALIPSO attenuation level

# Low-level cloud cloud base

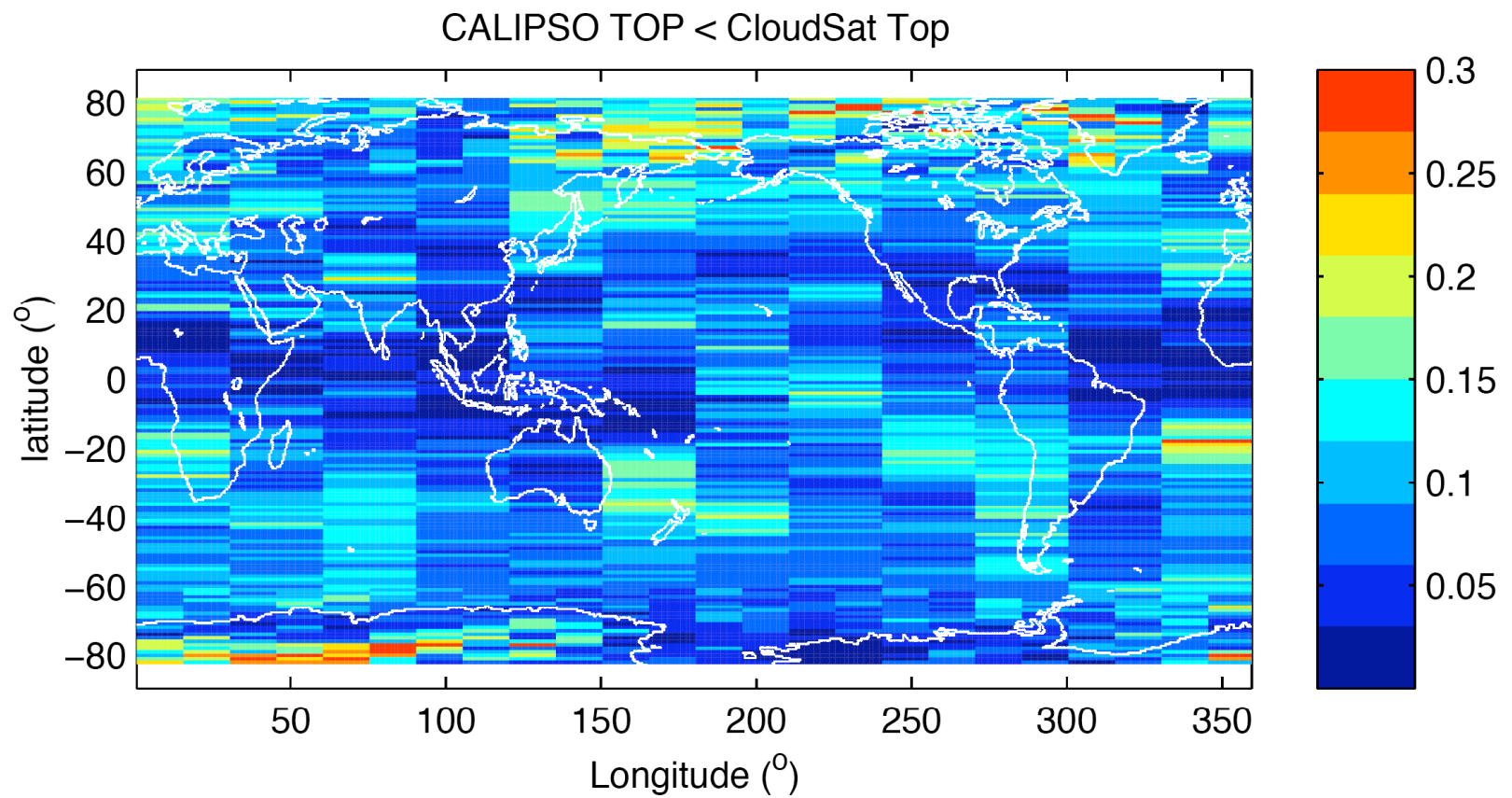


# Cloud Top

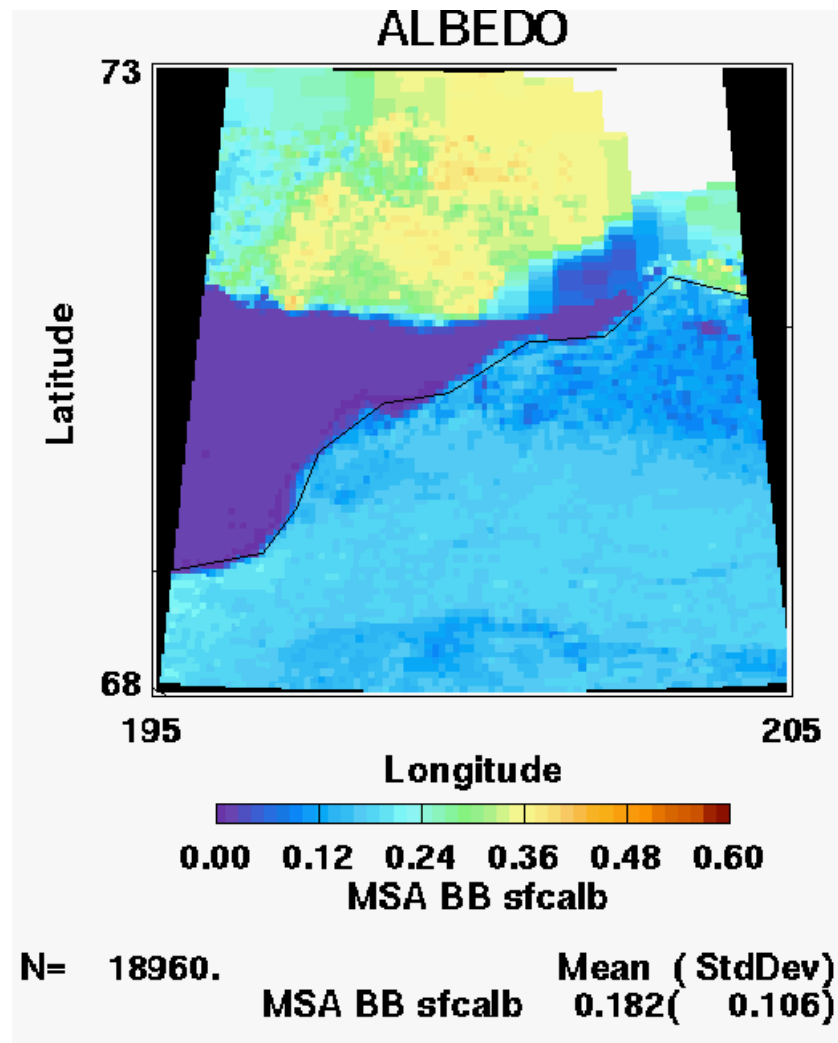




# Cloud Top

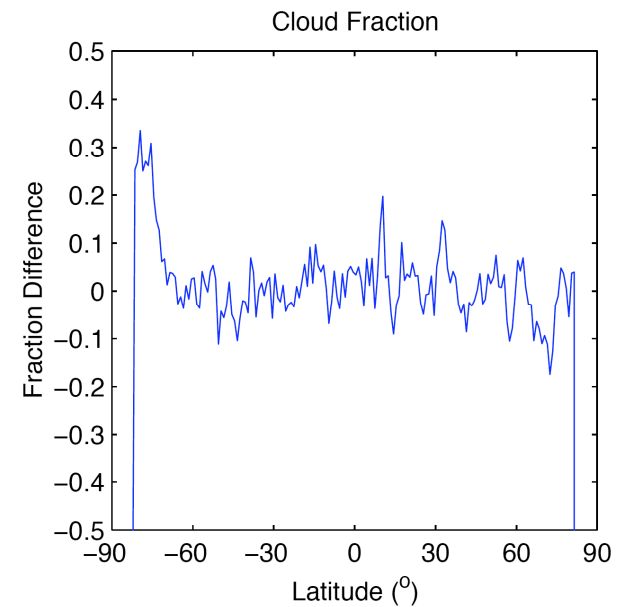
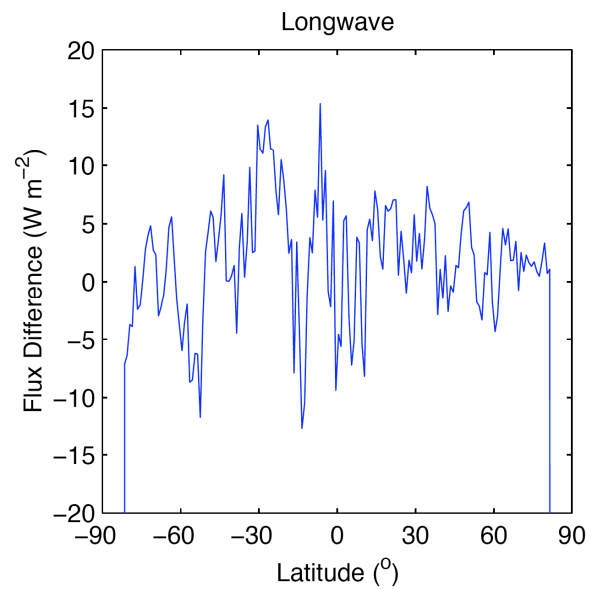
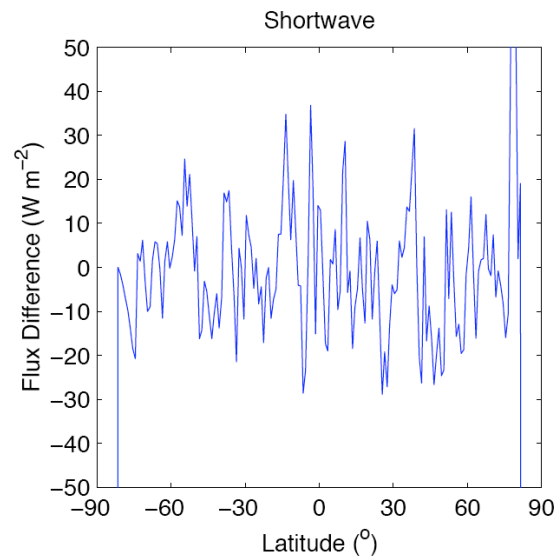


# MODIS derived Surface albedo



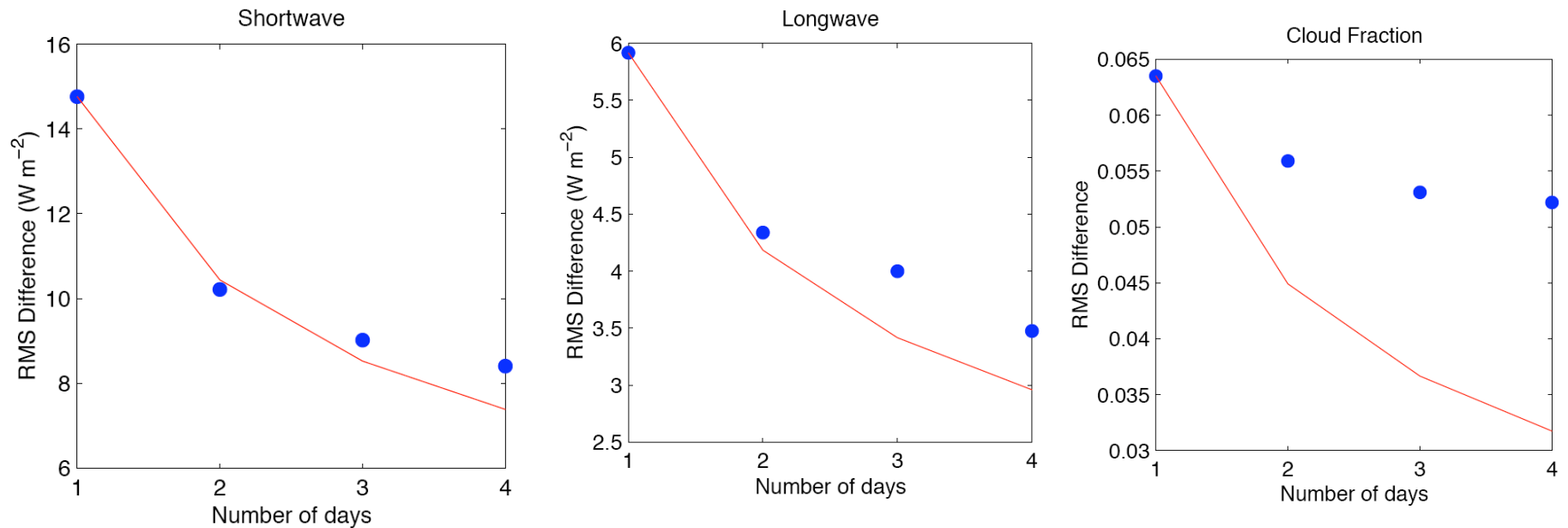
Broad band  
VIS  
NIR  
7 narrow bands

# RMS Difference





# Zonal Monthly Mean Uncertainty



Zonal Monthly Flux Uncertainty  
2 to 3  $\text{W m}^{-2}$  for SW  
~1  $\text{W m}^{-2}$  for LW

Viewing zenith  
Angle dependence?

# Future work

- Merge CALIPSO cloud and aerosol layer mean products.
- Apply CERES ADMs
- Compute radiative flux profile